Charge fluctuations in a transport model*

M. Bleicher, S. Jeon, and V. Koch

The event by event fluctuations of the ratio of positively to negatively charged hadrons are calculated within a hadron-string model (URQMD) [1]. In particular corrections for finite acceptance and finite net charge are derived and applied to the calculations. The most important correction for RHIC energy is that due to charge conservation, which is given by

$$C_y = 1 - \frac{\langle N_{ch} \rangle^{\Delta y}}{\langle N_{ch} \rangle^{\text{total}}} \quad . \tag{1}$$

whereas the correction due to a finite net charge is only relevant for SPS energies. Applying both corrections to the results of URQMD we find a weak dependence on centrality fig 1.

The dependence on the size of the rapidity window Δy (fig .2) further confirms the predictions of [2,3]. For small Δy one recovers the predicted r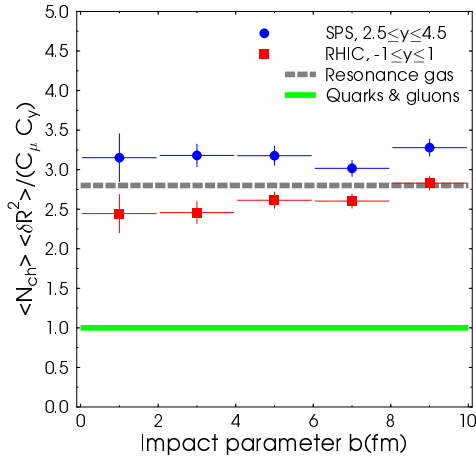esult of an uncorrelated pion gas. As the width of the rapidity window increases, the correlations due to resonances reduce the fluctuation to the value predicted in [2,3]. The effect of the global charge conservation is also obvious from the open symbols in fig. 2. Only if the correction formula is applied does the value remain constant with increasing window size.

In conclusion, the URQMD model gives charge fluctuations which are compatible with the predictions for a hadron gas, as expected, since it does not contain explicit parton degrees of freedom.
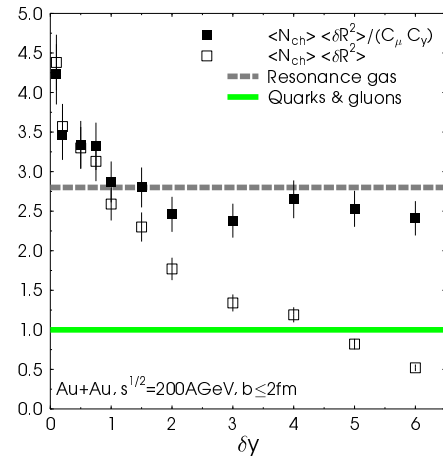

Figure 2: Dependence of fluctuations of the ratio of charged particles on the width of the rapidity window.

Figure 1: Centrality dependence of the fluctuation of the ratio of charged particles.

[1] S.A. Bass et al., Prog. Part. Nucl. Phys. **41**, 225 (1998);

[2] S. Jeon and V. Koch, Phys. Rev. Lett. **85** (2000) 2076.

[3] S. Jeon and V. Koch, Phys. Rev. Lett. **83**, (1999), 5435.